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## Canning Club Demonstration Problem 1 Vegetable and Fruit Canning : Extension Circular 9-21-2

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Revised  
1928

Nebraska  
COOPERATIVE EXTENSION WORK  
IN AGRICULTURE AND HOME ECONOMICS  
U. of N. Agr. College & U. S. Dept. of Agr. Cooperating  
W. H. Brokaw, Director, Lincoln

Extension  
Circular  
9-21-2

CANNING CLUB DEMONSTRATION  
Problem I  
VEGETABLE AND FRUIT CANNING

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What causes Food to Spoil?

Did you ever leave a good sound apple on a pantry shelf and watch it for a long time? For weeks perhaps it was firm, then it gradually became dark and soft in spots. The dark spot grew larger and finally the whole apple was brown and soft. If you wrap an equally good apple in paper and put it in a cool, dry place, you will find that it stays firm for a longer time, but finally decays. If this apple is peeled it will spoil more quickly, because the outside skin, which protects the inner part, is removed. Many years ago people found out that living bodies in the air caused food to spoil. These bodies are so tiny they cannot be seen except with a microscope. Scientists have studied them and tell us that those which spoil food belong to three groups: yeasts, molds, and bacteria.

Besides these living bodies, there is another cause for food spoilage. Substances called enzymes present in all fresh fruits and vegetables cause ripening, and unless their action is checked, the ripening will go too far and cause decay. Enzymes are easily destroyed by heat, so this is a reason for canning fruits and vegetables as soon as possible after gathering.

Where are Yeasts, Molds and Bacteria Found?

They are found EVERYWHERE, in air, water and soil and on food. They are very light and are easily blown about, alighting on the surface of furniture, on hands and faces, on utensils, on unprotected and exposed food. If there is a leak in the jar when you are canning, air, which always contains these living forms, enters. If conditions are favorable, the bacteria grow and finally cause the product to spoil.

What Do These Living Bodies Need In Order to Grow?

They need about the same things that all living things need: the right amount of heat, food and water. Most of them also need air but there are some bacteria which grow better in a tightly sealed jar where no air is present.

What Happens When These Living Bodies Grow on Food?

Have you ever noticed the taste of alcohol in fruit which has been cut and has stood in a warm place for several days? Yeast plants of the air change the sugar in the fruit to alcohol. Canned fruit which has worked or fermented has the taste and odor of alcohol. If you have ever watched mother make vinegar, you know that when the fermentation goes on for some time the alcohol is changed to an acid, and you get the sour flavor of vinegar. This change is caused by the action of bacteria. There are certain bacteria which also cause fermentation in foods.

The "furry" different colored molds which we see growing on bread and other foods make the molds seem more familiar to us than the yeasts and bacteria which we cannot see. One must examine a mold closely to see the tiny black heads which grow at the end of the threadlike projections. These heads or pods contain many tiny specks which we call spores or seeds. When the pod is broken open these little spores fly about in the air and settle on anything which happens to be in their path. If one of these spores falls on a place where there is warmth, moisture, air, and proper food it grows into a mold plant which branches out and

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spreads rapidly. If it lacks any one of these it does not grow, but simply stays in this resting or spore form. Bacteria also form spores and they change from the growing to the spore forms when they lack something they need for growth. These spores are like seeds; they last a long time, but the growing forms are more easily destroyed. Only the growing forms spoil food so if we make conditions unfavorable, these living bodies will not grow on our food.

#### How Do They Spoil Food?

If you have watched a glass of jelly which has mold growing on it, you have observed that the jelly gets lower in the glass as the mold gets thicker. This shows that the mold feeds on the jelly. When yeast plants act on food containing sugar they change it into alcohol and carbon dioxide gas. This gas goes off into the air in bubbles and if there is further action, the alcohol is changed into an acid. There are many different forms of bacteria. Some, like yeasts, cause fermentation of sugars, others act on protein foods such as peas, beans, milk, cheese and meat. In general we can say that these living bodies destroy the food and use it for their own growth.

When we think of bacteria causing many diseases we are likely to consider them all as our enemies. This is not true; many are useful and necessary. For example, the same yeast and bacteria which cause fruit to ferment are used in making vinegar. The good flavor of butter and cheese is due to the action of bacteria. If we keep our bodies healthy certain bacteria will destroy any harmful ones which might cause disease.

You know that if an apple core is thrown out into the yard it will decay or disappear in a short time. The bacteria of the air act on waste material and finally change it into other forms. If this were not true the earth would soon be covered with trash. So the bacteria which cause decay may be our friends as well as our enemies.

#### How Can We Make Conditions Unfavorable for the Growth of These Living Bodies?

1. By drying, which takes away the moisture they need. If foods are not sufficiently dried, both molds and bacteria will develop.
2. By preserving, pickling, or salting, because bacteria cannot grow if the food contains a large amount of sugar, vinegar or salt.
3. By freezing or keeping at nearly freezing temperature. Growth is checked while the temperature is near freezing, but continues when the temperature rises. Freezing is zero degrees on the Centigrade (C) thermometer and 32 degrees above zero on the Fahrenheit (F). When you study Physics you will learn more about these.
4. By canning, which is boiling for a certain length of time to kill the bacteria already on the food, the jar, and the water and air in the jar, and then sealing to keep other bacteria from entering. Products canned in a pressure cooker are processed at a temperature higher than boiling.

#### What Effect Does Heat and Cold Have on Yeast, Molds and Bacteria?

Freezing does not kill these living bodies but makes them inactive so they cannot spoil food. Yeasts and molds grow best in a warm place, about 70 degrees to 80 degrees F., which is about the temperature of a warm summer day. Nearly all of these living bodies are killed if the temperature gets up near the boiling point of water which is 100 degrees C and 212 degrees F. Many forms of bacteria are able, when unfavorable conditions arise, to go over into a spore or seed form in which they are difficult to kill. The spore forms of bacteria have a thick



covering which protects them against drying, freezing and high temperatures. It requires long-continued heating to kill the spore forms of bacteria at boiling temperature especially if the product has juice that is neutral or only slightly acid. When the juices are acid as in fruits and tomatoes, both the growing and spore forms of bacteria are killed more quickly at the temperature of boiling water. The Government recommends the use of a pressure cooker for non-acid vegetables and meats because the bacteria are killed more quickly at temperatures above the boiling point of water. The necessary time of heating varies with some bacteria from 6 hours at boiling temperature (212 degrees F) to 30 minutes at 240 degrees F, the temperature obtained in a pressure cooker at 10 pounds pressure. If some of the spores live through the canning process, they may grow into living bacteria which form many more bacteria and the product will spoil even though the jar is sealed tightly.

What are the Most Important Methods of Canning?

1. Jar-processed, hot-pack method. The product is precooked, placed into the jar boiling hot, sealed and processed.
2. Jar-processed, cold-pack method. The product is packed into the jar, the jar is then filled with boiling hot liquid, partially sealed, processed and then tightly sealed. This method is similar to the old "cold-pack" method in which the product was either placed into the jars raw or was blanched and cold dipped before placing into the jars and then processed.
3. Kettle-processed or open kettle method. The product is completely cooked in a kettle, the sterilized jars are filled with the boiling hot product and sealed tightly.

What are the Disadvantages of the Kettle-processed Method?

1. The product is exposed to the air after processing. When the product is poured into the jars, bacteria and molds from the air enter with the product and are not destroyed unless the temperature of the product is sufficient to destroy them. This is the reason that mold is frequently found on kettle-processed products.
2. Air in the space at the top of the jar is not processed so that molds and other living bodies in it may develop and cause spoilage.
3. Few products are successfully canned by this method.
4. There are more chances for spoilage so as a rule we do not recommend the kettle-processed method.

What are the Advantages of the Jar-Processed Method?

1. It is the surest way to can, because there is little chance for bacteria to enter the jar after processing. Mold is never found on the jar-processed products if they are properly processed and sealed.
2. Non-acid vegetables and meats will not keep by the kettle-processed method because they contain the spore forms of bacteria which are harder to kill and because they lack acid.
3. It is the safest way to can vegetables because no preservatives are used. Preservatives found in canning powders are harmful to health.
4. The product keeps its shape better, is of a more uniform market standard and the flavor is more natural.
5. It is a simple method and a successful one. Boys and girls can have just as good results with canning as their mothers, if they follow directions carefully.



Why is the Hot-pack, Jar-processed Method Recommended?

Because the time required for the material to reach the temperature of the canner is decreased when the product is packed hot.

Why is the Term "Processing" Preferable to Sterilizing?

The term "processing" is preferable because it is more accurate than the term "sterilizing". To process means to heat the product until it will keep or to render the living bodies inactive. To sterilize means to heat the product enough to kill all living bodies. Tests on some products show that they have been processed long enough to keep but they are not sterile. The physician sterilizes his instruments; the canner processes his products.

Why Should We Can Foods?

So that we may have a "year round" supply of "protective foods" or foods which will keep us healthy. Vegetables and fruits are good sources of the substances which are necessary for growth and health.

We need to balance our diet with vegetables and fruits in winter as well as in summer. In Nebraska we have eight non-growing months from October to June. Farm families must rely largely on stored and canned garden and orchard products during this period. See "Vegetable and Fruit Budget", Extension Circular 988.

It is more economical to save your own vegetables than to buy the entire winter supply or go without. There will always be a need for thrift.

Vegetables and fruits give a pleasing variety to the diet. We enjoy using products that we have raised and saved.

Equipment for the Jar-Processed Methods of Canning

What may be used for a canner?

1. A water bath canner must be deep enough so that the water will cover the jars. It should have a lid that fits and a false bottom. A wash boiler, a deep kettle or nail may be used.
2. A steam pressure cooker. The Government strongly recommends this for meat and vegetables canning.

False Bottoms

A suitable false bottom allows the water to circulate freely underneath the jars. It should fit the canner so the jars will not tip. The following false bottoms may be used:

1. Rack of wire mesh at least 3/4 inch high.
2. A wooden rack floats, but if weighted, is satisfactory.
3. Wire baskets, which have raised bottoms.

What are the Principal Types of Jars Used?

1. Screw lid.
2. Glass lid.
3. Metal lid with composition rubber.

What are Good Lids?

1. Screw lids--should have straight dull edges, (if sharp they cut the rubber) no cracks, should not be corroded, as such spots often contain tiny holes.



2. Glass Lids--should have an even edge when placed on a flat surface and no nicks.
3. Metal Lid with composition rubber--The rubber should be firmly attached all around the lid, should be of good quality, gummy, not granular and hard.

#### How to Tell Good Rubbers.

1. Measurements of a rubber.
  - a. Thickness  $1/12$  of an inch. One dozen rubbers held tightly measure one inch.
  - b. Width of rubber  $10/32$  inch.
  - c. Inside diameter of rubber two and one-fourth inches.
2. Tests for rubber.
  - a. Good rubbers should stand all of the tests given on pages 7 and 8.

#### What May be Used to Lift Jars from Boiling Water?

1. Hot lift tongs or other devices.
2. Wire basket with bail.

#### Difficulties with Equipment and How to Avoid Them

1. Loss of liquid from jars during processing.
  - a. Causes - precooking omitted or improperly done, lids adjusted too loosely.
  - b. Causes in water-bath.
    - Water does not cover tops of jars.
    - False bottom does not permit water to circulate underneath.
    - Water boils too rapidly.
  - c. Causes in pressure cooker.
    - Allowing steam to escape rapidly.
2. When rubber breaks or pushes out during processing.
  - a. Causes--jar sealed when product was not boiling temperature, water boiled too rapidly, poor quality rubber.
  - b. If rubber pushes out slightly, work it back into place before tightening lid.
  - c. If rubber breaks or stretches so that air enters the jar, replace with a new one and process 15 minutes longer for vegetables and meats. Avoid this by using new rubbers of good quality.
3. Screw lid cuts into the rubber.
  - a. Edge of lid may be sharp. Dull it by rubbing with a strong metal edge such as the back of a knife blade.
  - b. Patent tighteners often cause the lid to cut into the rubber. Seal with the hand.

#### Steps in the Kettle-Processed Method

- I. Wash, test and boil jars, lids and rubbers. Place rubbers on jars before putting them in the water.
- II. Select only fresh, firm products. When in season the flavor is best and price lowest.
- III. Grade for size, color and ripeness.
- IV. Wash product and where practical prepare as for table use.
- V. Scald peaches and tomatoes enough to loosen the skin. Cold dip and remove skin.
- VI. Cook fruit in boiling water or thin syrup until tender.
- VII. Remove a jar from boiling water and place it in a pan of hot water or on a wet cloth wrung out of hot water while filling. See that the rubber is in place. To help prevent spoilage observe these precautions.



- A. Be careful not to touch jar rubbers or the inside of the lid because fingers are carriers of germs.
- B. It is best to dip jar fillers and any utensil which touches the product into boiling water immediately before using.
- VIII. Fill jar to over-flowing with the boiling hot product.
- IX. Seal immediately.
- X. Cool rapidly and observe the seal. If the jars are carefully tested before hand, as described on pages 6 and 7, there should be no leaks. If, however, the seal is not perfect, open, heat contents to boiling and re-can.
- XI. Label, wrap and store in a cool, dry place.

#### Steps in the Jar-Processed Methods

Arrange for plenty of hot water. Assemble the necessary equipment.

- \*I. Wash, test and boil jars, lids and rubbers.
  - \*II. Select only fresh, firm products.
  - \*III. Grade for size, color and ripeness.
  - \*IV. Wash product and where practical prepare as for table use.
  - V. Scald or precook.
  - VI. Remove skins and otherwise prepare. Only a few products are cold dipped (in order to remove the skins quickly). Because cold dipping lowers the temperature and the material should be filled into the jars as hot as possible.
  - \*VII. Hot-pack or cold-pack (depending on nature of product).
  - VIII. Seal if the product is boiling hot. If the product is below boiling make a partial seal.
  - \*IX. Process the required length of time.
  - X. Remove one jar at a time, examine rubber and seal tightly if the jar is not already tight.
  - XI. Cool rapidly and observe the seal. Care in testing the jars before filling is usually sufficient but it is best to observe the seal for a short time before storing.
  - XII. Label, wrap and store in a cool, dry place.
- \*The most important steps in canning.

#### Explanation of Steps in the Jar-Processed Methods

- I. Test, wash and boil jars, lids and rubbers.
  - A. Testing jars, lids and rubbers.
    - 1. Screw lid jars.
      - a. Run the fingers around the edge of the lid and the edge and shoulder of the jar to detect nicks, cracks and other flaws.
      - b. If the inner lining of the lid is cracked, discard the lid.
      - c. Metal lids which have been pried loose usually cause trouble.

An uneven edge can sometimes be remedied by placing the lid on a flat surface and rubbing the edge with a strong blade or knife handle until it lies flat on the table and touches at all points.

Jars may be opened by inverting the lids in hot water or by pulling out the rubber.

Never open with a knife if you expect to use the lid again.



- d. If the edge of the lid is sharp it should be rubbed until dull with a metal surface so it will not cut into the rubber.
- e. Make a final test in this way. Put hot water in the jar, place rubber and lid in position, make a tight seal and invert jar. Allow jars to stand inverted five to ten minutes to detect slow leaks.

If leak is above rubber, lid is usually defective. If leak is below rubber, jar is usually defective.

## 2. Glass Lid Jars

- a. Run the fingers around the edge of the lid and the edge and shoulder of the jar to detect nicks, cracks or other flaws in the glass.
- b. Place rubber and lid on jar. Put wire bail in place over the top of the lid.

If the bail does not go on with a snap when the side clamp or tightening lever is up, remove it from the jar and with the thumbs bend it down in the center, as shown in Figure 1. The ends of the bail usually need to be pressed inward before it can be replaced on the jar. See Figure 2.



Fig. 1. Bend down in center

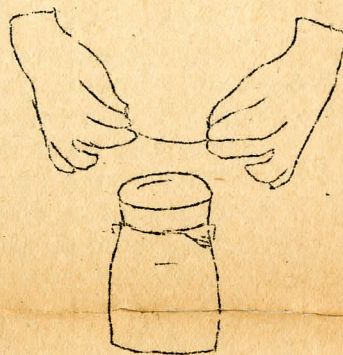


Fig. 2. Bend in the ends.

Return bail to the jar, put it in place over the top of the lid and see if it goes into the groove with a snap. If so, put hot water in the jar, make a tight seal by pressing the tightening lever down and test again by inverting the jar. If there is no defect in the jar or lid and the jar leaks, tighten the bail again.

If the bail is too tight, it should be loosened by bending in the opposite direction to that given for tightening.

A little experience will make this adjustment process a simple matter. This testing of the bail should be done every time the jar is used for canning.

3. Metal lid jar with composition rubber.
  - a. Examine both jar and lid.
  - b. See that rubber is not cracked or pulled away from the metal lid.
  - c. Rubber should be gummy, not granular or hard.
  - d. This type of jar cannot be tested with water because the rubber composition does not form a tight seal until it cools after the processing period is over.
4. Test rubbers.
  - a. Rubber should stand pulling, pinching, twisting and return to its original size and shape.



- b. Rubber should be strong enough to hold a weight of seventeen pounds
  - c. Four inches of a rubber ring should stretch to ten inches without breaking.
  - d. Rubber should fit closely, requiring a little stretching to get it around the neck of the jar.
  - e. Rubber should stand several hours of boiling in a water bath canner.
  - f. Color should make no difference in quality.
5. Testing is one of the most important steps because if the seal is imperfect for any reason, products will not keep.
- B. Wash and rinse jars, lids, and rubbers thoroughly.
- C. Boil jars, lids, and rubbers.
1. After testing and washing, jars, lids, and rubbers should be put on in cold or warm water and brought to boiling.
  2. Place rubber on jar before it is put into the processing water. This saves handling after it has been boiled.
  3. The object in boiling jars is to heat them so it is safe to plunge them into boiling water after filling. Boiling further cleanses the jars.
  4. Jars may be boiled in the processing water. This saves space on the stove. Jars may be heated in a steam bath or in an oven. When heating in an oven be careful not to heat them too much.
- II. Select only fresh, firm products.
- A. Vegetables should be gathered during cool morning hours and canned immediately for best results.
1. "Two hours from garden to can" is an excellent slogan for home canners especially when canning non-acid vegetables.
  2. If products must be kept a short time, discard any showing bruises, decay or other imperfections, and keep the remainder in a cool place in small lots, well ventilated.
  3. Be sure that all equipment used in handling products for canning is clean. Any unnecessary infection increases the difficulty of processing and the chances of spoilage.
- B. Flat sour.
1. Definition - flat sour is a condition of canned vegetables in which the taste and odor is affected altho the appearance is not changed.
  2. Flat sour develops at two ranges in temperature, the lower from 70 to 90 degrees F., the higher from 140 to 159 degrees F. Flat sour may develop in vegetables if there is delay at any stage of the canning process, for example, if the products stand too long before canning, stay in cold dip too long, stand for too long a time packed in the jars before processing or if the jars are placed close together so that they cool down slowly after removal from the canner.
  3. To avoid flat sour have table tops, stoves and all utensils clean when canning, use perfectly fresh products, prepare them properly, pack one jar at a time and place in canner as soon as it is packed, cool rapidly after canning.
  4. Corn, peas, beans and asparagus spoil more readily than other vegetables, so one should be especially careful when canning them.
- III. Grade for size, color and ripeness.
- A. Products at the best stage for eating are also best for canning. Grade carefully, selecting the best for canning.
- B. Small vegetables and fruits cook more quickly than large ones.
- C. The time for processing varies somewhat with the age of the vegetable so grading is important if a good, uniform product is desired.



- IV. Wash product and where practical prepare as for table use.
  - A. Soil contains bacteria which are especially hard to destroy, therefore, wash products thoroughly until every trace of soil is gone.
    - 1. A vegetable brush helps in washing some vegetables.
    - 2. Wash vegetables, like beans, thoroughly before cutting because it is difficult to remove dust which lodges inside of the pod.
  - B. To wash berries place them in a strainer and pour water over them until the water which drains off is clear. A strainer or wire basket should not be loaded too heavily.
  - C. Remove products from water as soon as they are clean.
  - D. Always lift the products out of water rather than pour water off of them.
- V. Scald or precook.
  - A. Scalding means placing the product in boiling water for a short time.
    - 1. The object of scalding is to loosen the skin so it may be removed easily.
    - 2. The time for scalding depends largely upon the maturity of the product. For example, ripe tomatoes are scalded in a shorter time than slightly under-ripe ones.
    - 3. For convenience in handling, the product is placed in a wire basket or square of cheese cloth.
  - B. Precooking means partially cooking the product. The method and time of precooking varies with the product. Some products are boiled for a short time, some are steamed and others, such as meats, may be seared in hot fat or in the oven before packing.
    - 1. Reasons for precooking.
      - a. Removes air.
      - b. Shrinks and wilts the product.
      - c. Makes it possible to pack the product at boiling temperature.  
This makes it easier to process the product.
    - 2. Precooking in steam is recommended for greens.
      - a. May be done in a tightly covered kettle with just enough water to prevent burning. Use this liquid when filling the jars because it has food value.
      - b. A steam pressure canner may be used. In this case the petcock should be left open and the lid need not be clamped into position.
- VI. Remove skins and otherwise prepare.
  - A. A few products are cold dipped by plunging them quickly in cold water.
    - 1. They are not allowed to remain in cold water more than 5 to 10 seconds.
    - 2. Products are cold dipped so they may be handled quickly to remove skins.
  - B. Remove skins from such products as peaches, tomatoes and beets.
    - 1. After removing skins, dip the product in rinse water to wash off any particles that may cling to it and later float into the liquid.
    - 2. Either pack the product into the jars and fill with boiling liquid or heat the product in the liquid before filling the jars.
- VII. Hot-pack or Cold-pack (depending on nature of product).
  - A. When ready to fill jars remove them from the boiling water.
    - 1. See that the rubber is in place.
    - 2. When rubber curls, press it down. If necessary, remove from jar, stretch and reverse it.
  - B. Hot-pack. When the boiling hot product and liquid is poured into the hot jars.



1. Care should be taken that the jar is not placed on a cold surface.
- C. Cold-pack. When cold products are packed into hot jars.
  1. Keep jar hot while packing by placing it in a pan of boiling water.
  2. Fill jars of fruit with boiling syrup.
  3. Fill jars of vegetables with the liquid in which they are pre-cooked or with boiling water and add one teaspoon of salt.
- D. If particles of the product remain on the rubber they should be wiped off.

VIII. Seal as follows:

- A. In the water bath.
  1. If the jars are filled with boiling hot material they may be sealed completely before processing.
  2. If the material is not boiling hot when packed, the jars should be only partially sealed when put into the water bath.
- B. In the pressure cooker.
  1. Jars should be completely sealed before processing in the pressure cooker.
  2. Hot jars should be filled with boiling hot material before sealing.
- C. The following table tells how to make a partial seal and a tight seal with the different types of jars:

Jar	Partial Seal	Tight Seal
Screw lid	Tighten lid then turn it back 1/8 in.	Turn lid until tight
Glass lid	Snap the top bail into place and leave the side clamp up.	Turn the side clamp down.
Metal lid with composition rubber.	Place lid, press it down, around the edge and put on the wire clamp or screw ring.	Leave clamp or screw ring on until the jar is thoroughly cold. With this type of jar a tight seal is formed as the jar cools

IX. Process the required length of time.

- A. In a water-bath canner.
  1. Place enough water in the container to cover the tops of the jars.
  2. After testing and washing, place jars in the processing water so they will be boiling hot when you are ready to fill them.
  3. Have the water in the canner boiling before putting in the filled jars. To prevent breakage the jars should be boiling hot and be filled with hot material.
  4. Be sure the jars are far enough apart and that the rack on which they are supported is so arranged that the water can circulate freely under and around them.
  5. When all the jars are in the canner, see that the level of the water comes over the lids about one or two inches.
 

If necessary add more boiling water so that it covers the jars throughout the processing period.
  6. Count time as soon as the water begins to boil vigorously.
  7. Keep the water boiling during the full processing period.
  8. As soon as the processing time is up remove the jars from the water.
 

If the jars were not sealed completely before processing, seal wire clamp jars before removal from the canner and all other jars immediately afterwards.
  9. Place jars far enough apart so they will cool quickly to room temperature. Plunge tin cans at once in cold water.



B. In a steam-pressure canner.

1. Pour boiling water into the canner until the level is just below the rack that holds the jars. Observe the water in the canner each time after removing jars and add more if necessary to prevent its boiling dry.
2. Seal jars completely before processing them in a pressure canner.
3. Place each jar in the canner as soon as packed.
4. When the canner has been filled, adjust the cover and fasten securely.  
In case the cover is fastened by several clamps, fasten moderately tight those opposite each other, one pair at a time; then go back over the whole set and tighten each pair.
5. See that no steam escapes anywhere except at the pet cock.
6. Allow the pet cock to remain open until steam escapes from it in a steady stream for at least three minutes, indicating that no air remains inside.
7. Close the pet cock so that only the slightest trace of steam can escape. Most people prefer to close the pet cock of a small canner entirely because if much steam is lost it boils dry.
8. Allow the pressure to rise until the gauge registers the desired pressure.
9. Begin to count time when the desired pressure is reached.
10. Keep a uniform pressure during the processing period by carefully regulating the heat.

Changes in pressure, as from ten pounds to fifteen pounds and down again, may cause a loss of liquid from the jars. A sudden drop in pressure through cooling or release of steam may also cause a loss of liquid from jars.

Do not allow the pressure to go so high that the safety valve releases the steam suddenly. Do not open the pet cock when there is pressure in the canner because this also releases the steam suddenly.

11. At the end of the processing period, remove the canner from the fire.
12. When canning in glass jars allow the canner to cool until the steam gauge registers zero before opening the pet cock, and even then open it cautiously.

This is to prevent too sudden a drop in pressure, which would cause the liquid to blow out of glass jars, even though they are sealed.

13. Place jars far enough apart so they will cool quickly to room temperature.
  14. When canning in tin open the pet cock wide and allow the steam to escape rapidly. Remove tin cans and plunge them into cold water.
- C. The United States Department of Agriculture recommends that non-acid vegetables and meats be canned in the pressure canner.

Dr. Stanley, Chief of the Bureau of Home Economics says that where the water bath method is used for vegetables and meats each state must be responsible for its own time table because conditions vary so much over the United States.

Dr. Stanley urges that products canned in a water bath be used the same year and adequate precautions be taken in their use.

See precautions in Extension Circular 958 at the back of this problem.

- D. There is a greater chance for imperfect processing when canning in the steam cooker. If the steam cooker is used, be sure the water is vigorously boiling the whole time.



The time for processing should be increased one-third of the amount given for the water bath because the steam chamber is not at boiling temperature after the doors are opened to place products in the canner.

Time must also be added if the door is opened during the processing period because steam rushes out and the temperature lowers whenever the door is opened. We do not advise the use of the steam cooker but it may be used for fruits and tomatoes if one removes them when the products seem to be thoroughly cooked.

- E. Farmers' Bulletin No. 1471, "Canning Fruits and Vegetables at Home" gives the following suggestion with the water-bath time table for canning fruits and tomatoes.

"When half-gallon glass jars are used, add 5 minutes to time given for pint and quart glass jars."

The government Bulletin gives no time table for canning non-acid vegetables and meat in a water bath. The time table on page 21 of the F.P. 1471 gives the time for processing pint and quart jars only so we conclude that it is not best to use half-gallon jars for non-acid vegetables. If they should be used we think it advisable to hold to the old rule which was: "Add one-half more time for two-quart jars."

- X. Remove one jar at a time.

- A. Examine the rubber and seal tightly, if the seal is not already tight.
1. If the rubber has pushed out it can often be pressed back into place without admitting air.
  2. If it is necessary to open a jar and replace the rubber, seal and process vegetables and meats again for 15 minutes.
- B. See directions for sealing jars on page 10.

- XI. Cool rapidly and observe the seal.

- A. Glass jars.
1. Avoid cold drafts.
  2. Place jars far enough apart so they will cool quickly. Do not cover with a cloth as this means slow cooling.
  3. Do not disturb seal after the product is cold. While cooling, the screw lid jar may be tightened more if necessary.
- B. Tin Cans.
1. Plunge tin cans into cold running water, or if this is not available, change the water as soon as it becomes warm.
  2. Watch carefully for air bubbles that indicate imperfect sealing.
- C. Care in testing the jars before filling is usually sufficient but it is best to observe the seal for a short time before storing.

- XII. Label, wrap and store in a cool, dry place.

- A. Label jars with the date of canning.
- B. Wrap glass jars in paper or place in jar boxes.
1. Wrapping helps to preserve color.
- C. Store in a cool, dry place.

#### Directions for Canning Fruits, Tomatoes and Pimentos by the Jar-Processed Methods.

The time for processing products in the following recipes is taken from Farmer's Bulletin 1471, which is the latest Government authority. This bulletin gives a time that is sure to keep the products but it is often too long for the best appearance and flavor. For example peas that are cooked tender in 15 to 30 minutes must be processed for 180 minutes in the waterbath and 50 minutes in the pressure canner at 10 pounds pressure. This long processing overcooks the peas and makes them less attractive but it is necessary in order to keep them. Many of the 4-H Club canned products have been too soft to score high in exhibits. Some products which have scored high at the State Fair did not look well after shipping to Chicago. Thus club members must be especially careful with products which they

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plan to exhibit. The following suggestions for exhibit of jars may be helpful.

1. Select products of the best quality. Firm products are essential for high scoring jars.
2. Handle carefully when packing. A dull packing stick which does not cut the product is better than a knife or spoon. (For example a bamboo stick)
3. Syrup often contains specks which should be strained out.
4. When products are preheated in liquid which is used later for filling the jars, the liquid may need to be strained through a cloth to make it clear. Clear liquid is essential for high scoring jars.
5. Mold disqualifies canned products which are exhibited. Use the jar-processed methods to insure against mold.
6. As a rule we heat jars to boiling temperature before filling them. In case of fruits, canned by the jar-processed, hot-pack method, and processed only 5 minutes, it is best to boil the jars about 15 minutes before filling them.

The Government advocates a time which will be satisfactory in all parts of the United States and advises the different states to vary it according to their conditions. If you have had success using a shorter time than that given for acid fruits and tomatoes, it will probably be safe to continue using it for those products. However, the following is an important precaution, never shorten the time for processing non-acid vegetables and meats. Non-acid vegetables are practically all vegetables with the exception of tomatoes. The reason for this precaution is that products which are not acid are hard to keep and botulinus toxins develop more readily in them than in acid products.

#### Syrups for Canning Fruits

<u>Kind of Syrup</u>	<u>Sugar</u>	<u>Water</u>	<u>Uses</u>
Thin	1 part	3 parts	Sweet berries and non-acid fruits
Medium	1 part	2 parts	Berries and slightly acid fruits
Thick	1 part	1 part	Acid fruits
Very thick	1½ parts	1 part	Very acid fruits

Heat the sugar and water to boiling, stirring to dissolve the sugar.

Fruit juice may be substituted for water in making the syrup.

The amount of syrup required to fill jars varies with the size of fruit and tightness of pack, about  $\frac{1}{2}$  cup for pint jar and one cup for quart jar.

For a close pack use a heavy syrup because there is more fruit to sweeten. Too much sugar destroys the delicate fruit flavor, is wasteful and not healthful.

#### Apples

Apples may be pared, cored and cut into the sizes desired. If the pieces must stand, place them in a mild salt solution (one-fourth cup salt to one gallon of water) to prevent them from turning dark. There is also another advantage, more vitamin is retained if the apples stand in salt water for some time.

Cold-Pack--They may be packed directly into jars and covered with boiling hot thin syrup. Process quart and pint jars for 15 minutes in boiling water. Apples packed raw shrink so that the containers are not full. This can be prevented by using the hot-pack.

Hot-Pack--Boil for 5 minutes in the syrup, fill jars with the boiling product and process for 5 minutes in boiling water. Apples may also be baked as for serving. Pack into the jars hot, cover with hot syrup and process 5 minutes in boiling water.

#### Apricots

Same as peaches, except that it is not necessary to remove the skin of the apricots. A clearer liquid results if the skin is not removed.



### Berries

Gather the berries in shallow vessels to prevent crushing and can them as soon as possible after gathering. Sort the fruit and use the smaller, less perfect berries for the preparation of juice which may be used in making syrup. Wash carefully and remove caps and stems. A strainer is useful for some berries. If washed after stemming flavor is lost. It is a good plan to have a pan of water at hand while stemming so that any berries which have specks clinging to them may be dipped into the water.

Cold-Pack--Pack the fruit in containers, pressing it gently into place. Cover with a medium syrup, boiling hot. Process for 20 minutes in boiling water.

Hot-Pack--Some berries shrink so much that the jars are not full and the berries float. This is prevented by precooking them before filling the jars. To each pound of berries add one-fourth to one-half pound of sugar, according to the sweetness of the fruit. Place in a kettle and heat to boiling, stirring gently, and boil for 5 minutes. Pack boiling hot and process immediately for 5 minutes in boiling water.

If this method does not prove satisfactory for strawberries try the following open kettle method. For a one-pint jar add one-half cup sugar to six cups of the prepared berries. Heat slowly to boiling in an enameled kettle with lid. Cover and remove from stove. Allow berries to cool in the syrup several hours or overnight. Heat again just to boiling temperature. Cover and allow berries to plump again in the syrup. Heat again and fill into hot jars, but do not process.

### Cherries

Cherries may be canned pitted or unpitted, depending upon personal taste and the way in which they are to be served.

Cold-Pack--Pack in hot jars, fill with boiling syrup, using thick syrup for sour cherries and medium for sweet. Syrup may be made from juice which collects when pitting the cherries. Process for 25 minutes in boiling water.

Hot-Pack--Precook by boiling for 5 minutes with sugar to taste. Fill into jars boiling hot and process immediately for 5 minutes in boiling water.

### Currants (Same as Berries)

### Gooseberries

Cold-Pack--Prepare, pack into containers, cover with a thick syrup. Process for 20 minutes in boiling water.

Hot-Pack--Prepare a sauce by adding a small amount of water. When the fruit is cooked sweeten to taste and pack boiling hot. Process for 5 minutes in boiling water.

### Peaches

Cold-Pack--Immerse the peaches in boiling water for about one minute or until the skins will slip easily. Plunge at once into cold water for a few seconds. Remove the skins, cut the peaches into halves and discard the pits. Pack at once, placing the halves in overlapping layers with the pit side downward. Fill containers with a boiling hot, thin syrup. Process for 25 minutes in boiling water if the fruit is firm and hard or for 20 minutes if it is ripe and tender.

### Pears

Pears may be canned the same as peaches.

Hot-Pack--Precooking makes hard varieties of pears pack better. Peel, cut in halves, core and cook in boiling medium syrup for 4 to 8 minutes, according to the size of the fruit. Pack the pears hot into jars and fill with boiling syrup. Process for 20 minutes in boiling water.



#### Pineapples

Cold-Pack--Peel, core and remove all eyes carefully. Cut into convenient cross sections, pack into jars and fill with thin boiling syrup. Process for 30 minutes in boiling water.

#### Plums

Cold-Pack--Plums are usually canned whole. Pricking sometimes helps to prevent the skin from bursting. Fill into jars and cover with boiling medium syrup. Process for 20 minutes in boiling water.

Hot-Pack--Plums may be brought to boiling, sweetened, and filled into jars. Process 5 minutes.

#### Rhubarb

Cold-Pack--Do not peel the rhubarb. Wash and cut it in pieces one inch long. If plunged into boiling water for about a minute shrinkage will not be as great. Pack into jars and fill with boiling hot syrup. Process for 20 minutes in boiling water.

Hot-Pack--Baked. Prepare rhubarb by adding one-fourth as much sugar as rhubarb by measure and bake until tender in a covered dish. Pack boiling hot and process 5 minutes in boiling water.

#### Tomatoes

Cold-Pack--Select tomatoes that are ripe but not over-ripe, free from blemishes and of medium size. Imperfect tomatoes may be used for catsup or puree or made into juice for filling the spaces left in a jar after the tomatoes are packed. Scald a few tomatoes at a time in a wire basket or a thin cloth, enough to loosen the skins. It usually requires from one-half minute to two minutes. The riper tomatoes need less scalding. Plunge into cold water for an instant. Remove the core and skins, starting at the stem end. Do not cut the seed walls if you intend to can the tomatoes whole. Pack into jars as closely as possible. Add one teaspoon of salt per quart. Fill with strained tomato juice or boiling water. If the tomatoes are to be sold under Federal Regulations only tomato juice may be added. Process for 45 minutes in boiling water.

#### Pimentos

Select ripe, sound peppers free from bruises. The pimento pod is thick and fleshy, covered with a thick tough skin which must be removed before canning. Wash, place in a pan with no water, put in a moderately hot oven for 6 to 10 minutes or until the skin blisters and cracks. Remove from oven, dip quickly in cold water and slip off the skins. Carefully remove the stem and seed core so that the flesh of the pimento is not broken. Flatten pimento and pack. No liquid is added, since the processing brings out a thick liquor which almost covers them in the can. Add one-half teaspoon of salt to each pint. Process pint jars 40 minutes in boiling water.

#### Directions for Canning Non-Acid Vegetables by the Jar-Processed Methods

The time table for processing the following vegetables in a pressure cooker is taken from Farmer's Bulletin 1471. Since the U. S. Bureau of Home Economics recommends that non-acid vegetables be canned in a steam pressure canner, this Bulletin does not give the water bath time for them. The water bath time given is that which has been used in Nebraska and found to be satisfactory. See the precaution about processing non-acid vegetables on page 13.

#### Asparagus

Asparagus for canning must be fresh and tender. Pick over carefully, discard any imperfect pieces and sort according to size. Wash thoroughly and discard tough stalks. It is often necessary to remove the scales from the stalks in order



to wash off all particles of soil. Tie in uniform bundles, place in a sauce pan with boiling water over the lower portion only, cover tightly, and boil for 4 to 5 minutes; or cut in half-inch lengths, add boiling water to cover and boil for two minutes in an uncovered vessel. Pack boiling hot into containers, cover with the water in which boiled and add one teaspoon of salt to each quart. Process for 120 minutes in the boiling water bath or 40 minutes in the pressure canner at 10 pounds pressure.

#### String Beans

Pick over and grade carefully, discarding the more mature ones. String without breaking the pod and wash thoroughly. Pods should be washed until the rinsing water is free from particles of soil before beans are cut. This is especially important with beans because particles of soil left on the pod may lodge inside of the bean when it is cut. Cut into pieces of desired size. Add enough boiling water to cover and boil for 5 minutes in an uncovered kettle. Pack into containers boiling hot, cover with the boiling liquid and add one teaspoon of salt to each quart. Process for 120 minutes in the boiling water bath or 40 minutes in the pressure canner at 10 pounds pressure.

#### Lima Beans

Only the young, tender lima beans should be canned. The older ones may be dried successfully. Shell, discarding any imperfect beans and wash until the rinsing water is free from particles of soil. Heat to boiling point in water to cover. Pack boiling hot into the containers, cover with boiling liquid and add one teaspoon of salt to each quart. Process for 180 minutes in the boiling water bath or 60 minutes in the pressure canner at 10 pounds pressure.

#### Baby Beets

Select young tender beets of the dark red variety for canning. Wash thoroughly, using a vegetable brush. Leave the roots and at least one inch of the stems on the beets while precooking to prevent bleeding. Precook in boiling water or steam for about 15 minutes until the skins slip easily. Slip off the skins. Pack into the jars, add one teaspoon of salt to each quart and fill with boiling water. Process for 90 minutes in the boiling water bath or 40 minutes in the pressure canner at 10 pounds pressure.

#### Carrots

Select young tender carrots. Mature carrots may be stored. Wash thoroughly, using a vegetable brush. Remove the crown and tip of root. Use whole, sliced or cubed. Cover with boiling water and boil. Pack into jars hot, add one teaspoon of salt to each quart and fill with boiling water. Process for 90 minutes in the boiling water bath or 40 minutes in the pressure canner at 10 pounds pressure.

#### Sweet Corn

Select ears of uniform size and proper ripeness. Corn is best for canning in the last days of the milk stage. If too young it is watery and if it reaches the tough stage it is tough and difficult to process. Sweet corn deteriorates rapidly and should be canned immediately after picking. Husk, silk and clean carefully. Precook 5 minutes and cut from cob, or cut from cob without precooking. Add half as much boiling water as corn by weight, heat to boiling. Add one teaspoon of salt and two teaspoons of sugar to each quart and fill boiling hot into containers. Process immediately for 180 minutes in the boiling water bath or for 80 minutes in the pressure canner at 15 pounds pressure.

#### Greens

Pick over the greens, discarding any imperfect leaves and tough fibrous stems. Wash carefully in running water or through a number of waters, lifting the



greens out each time. Wash until the rinsing water is free from particles of soil. Steam or heat the greens in a covered vessel until completely wilted. When heating add just enough water to prevent burning. Pack boiling hot into the jars, taking care that the material is not packed too solidly and that there is sufficient liquid to cover. The liquid circulates better if the greens are cut after packing. To cut, run a knife through the greens several times after packing them in the jar. Add boiling water if there is not enough liquid to fill the jar. Add one teaspoon of salt to each quart. Process immediately for 180 minutes in the boiling water bath or for 90 minutes in the pressure canner at 10 pounds pressure.

#### Okra

Can only the young, tender pods of uniform size. The older pods should be dried. Wash, remove cap without cutting into the pod, cover with water and bring to a boil. If okra is to be used for soup, it should be sliced. Pack into the jars hot, cover with the boiling liquid and add one teaspoon of salt to each quart. Process immediately for 90 minutes in the boiling water bath or for 40 minutes in the pressure canner at 10 pounds pressure.

#### Peas

Use only young tender peas. Grade for size and ripeness. Wash the pods to remove soil which clings to the hands and then to the peas. Shell, discarding any imperfect peas, and wash, lifting peas out of the rinse water. Bring to boiling in water to cover. Pack boiling hot into the jars, fill with the boiling liquid and add one teaspoon of salt to each quart. Process for 180 minutes in the boiling water bath or for 50 minutes in the pressure canner at 10 pounds pressure.

#### Vegetable Mixtures

It may sometimes be advisable to can vegetable mixtures. About two-thirds corn and one-third green lima beans makes a good combination for succotash. Prepare each and mix. Season and precook following the general directions for corn.

A 50-50 combination of corn and tomatoes is good for use as a vegetable. If wanted for a soup mixture, less corn should be used. Precook and process the length of time given for corn.

#### CANNING CLUB REQUIREMENT

We encourage club members to can with their mothers or some other adult. They may record in their record books all of the products which they help to can if they help through the whole canning process.

To be entitled to a Certificate of Achievement the following is required of first year canning club members:

Can at least 35 jars including three varieties of fruits and three varieties of vegetables. Score food habits.